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Tax Evasion and Tax Reform in a Low-Income Economy

General Equilibrium Estimates for Madagascar

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If Madagascar moved toward a simpler, uniform tax structure, it could raise the same revenues it now raises — with less incentive for the tax evasion and smuggling now prevalent.

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This paper — a product of the Trade Policy Division, Country Economics Department — is the product of a follow-up activity from a technical assistance mission to Madagascar in February 1989, carried out under the auspices of the joint UNDP/World Bank Trade Expansion Program. Copies of this paper are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Dawn Ballantyne, room N10-023, extension 37947 (June 1992, 34 pages).

Madagascar's weak administrative system and complex tax structure (with many exemptions) have led to tax evasion and smuggling. De Melo, Roland-Holst, and Haddad compare Madagascar's fiscal system with that of other low-income countries, noting its greater reliance on distortionary taxes.

Using a 10-sector model and general-equilibrium calculations, they estimate revenue losses from exemptions, tax evasion, and smuggling for three important tax instruments: import duties, value-added taxes, and excise taxes. Allowing for the agricultural and informal sectors to remain exempt from taxation, they estimate that applying published tax rates to the nonexempt sectors would raise tax revenue (from these three instruments alone) from 6.4 percent to 15.1 percent of GDP at a relatively low welfare cost (0.4 percent of GDP), because such a move would reduce dispersion across instruments and within the import tariff structure.

Next they calculate the welfare gain that would result from less distortionary tax structures. Simulation results suggest that the excess burden of taxes would be greatly reduced if Madagascar moved closer to a tax system with uniform rates across sectors and instruments. Relatively low uniform taxes would raise the same revenue as the structure prevailing in 1988, and would reduce incentives for tax evasion and smuggling.

Assuming that the uniform tax (for import and export duties, VAT, and excise taxes) would be imposed only in sectors in which tax collection is now positive, simulations suggest that a uniform tax rate of 6 percent across instruments would be enough to raise the same revenues collected under the current structure. Moreover, lower bound estimates indicate that the excess burden of taxation would be reduced by moving toward uniformity of about 5 percent of the tax base.

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Tax Evasion and Tax Reform in a Low-Income Economy: General Equilibrium Estimates for Madagascar

1. Introduction

Like many other poor countries with underdeveloped administrative capacities, Madagascar experiences substantial smuggling. The motives for smuggling are several, ranging from the desire to survive in the face of a host of barriers created by government policies and the lack of infrastructure, to tax evasion. The reasons for (and effects of) smuggling in the African context are well described by Stolper and Deardorff (1990) who argue that smuggling is unlikely to involve any extra real costs of trading and note that trade along an East-West axis is natural whereas states are often organized along North-South axes where trading is more difficult to organize. They even go further and argue that under African conditions smuggling is likely to shift out the production possibility curve as it is likely to reduce pervasive domestic distortions. Nonetheless, it is no exaggeration that, notwithstanding the proliferation of tax exemptions, smuggling to avoid taxes is pervasive in low-income countries where tax structures are exceedingly complex and tax administration is notoriously weak. Madagascar is no exception. Exemptions and evasions lead to a revenue loss and discriminatory taxes lead to a welfare loss. In this paper, we take a first step towards analyzing potential losses from these two effects. We also examine the resource allocation and welfare effects of revenue neutral tax reform.

Before embarking in an evaluation of potential tax loss, it is interesting to note the preoccupation of many developing country authorities with tax evasion. Again, Madagascar is no exception and has engaged the services of preshipment inspection (PSI) firms to verify that the quality and quantity of goods shipped meets contractual standards and that prices charged are within "reasonable" norms. A recent evaluation of Madagascar's use of PSI by Yeats (1991) comes to the conclusion that, by and large, it has not been either cost effective, or successful in reducing capital flight or customs duty avoidance. These concerns result from scrutinizing Madagascar's relative import prices before and after PSI requirements

were adopted and suggest that the problem of tax "avoidance" remains a lively issue deserving of further analysis.

In section 2, we describe briefly the Malagasy tax system and recent reforms aiming at streamlining the tax structure. We also compare the composition of government revenues with that prevailing in other low-income countries, noting that the Malagasy government raises a substantial proportion of its revenues from distortionary trade taxes. In section 3, we present the structure of a standard static general equilibrium model which we use to address the issues raised above. In section 4, we give rough calculations of tax revenues lost through tax evasion. In section 5, we report results of a standard analysis of tax reform in the absence of tax evasion and without a revenue constraint. The estimates in sections 4 and 5 are with a ten-sector model so as to allow for sufficient disaggregation to capture the distortionary effects of the Malagasy tax system. Conclusions follow in section 6.

2. A Description of the Malagasy Tax System and a Comparison with Other Countries

As the majority of developing countries, Madagascar has relied heavily on trade taxes as the major source of fiscal revenue. At the time of writing (late 1990), the tax system in Madagascar can be broadly described in terms of three major categories. First, domestic direct taxes which include income taxes, property taxes, and other taxes. Second, domestic indirect taxes which include the value added tax and the consumption tax. Third, international trade taxes which include export and import taxes. Table 1 summarizes the structure of the Malagasy tax system described in the text.

2.1 Domestic direct taxes

Tax on company profits (IBS). Companies are imposed a tax on profits (Impôt sur les Bénéfices des Sociétés, IBS) which affects net profit from all origins, including activities abroad. Foreign

Table 1. The Malagasy Tax System

Source	Type	Tax	Rates	1988 revenue[a] and (% of tax revenue)	
DOMESTIC TAXES	DIRECT		45% for commerce	22.7	(6)
		Profits (IBS)	35% for other activities	22.2	(6)
		Individuals (IGR)	Progressive max. rate: 45%		
		Property	(see text)	5.1	(1)
		Other	(see text)	6.5	(2)
	INDIRECT	Value-added (TUT)	15% except for exports, necessities and agricultural products	40.3	(11)
		Consumption tax (TC)	5% to 10% for most of 300 products (see text)	28.8	(8)
TRADE TAXES	INDIRECT	Customs duty (DD)	5% to 45% (see text)	18.3	(5)
		Import tax (TI)	5% to 80% (see text)	73.1	(20)
		Other import taxes	(see text)	11.2	(3)
		Export taxes	Specific tax on vanilla, cloves, coffee (see text)	43.8	(12)
		Value-added (TUT)	15% on imports	54.1	(15)

a. In billions of FMG.

Source: Authors' elaboration from Guillaumont et al. (1990).

companies are taxed only on profits realized in Madagascar. Collectives are not subject to this tax since the partners are subject to the tax on individuals. The tax rate on profits became uniform in 1983 and was fixed at 45 percent. Before that, companies were imposed different taxes depending on their economic activities. However, in 1987, in order to encourage industrial activity the following preferential rates were applied: 40 percent for industrial enterprises, 35 percent for agricultural enterprises, and 45 percent for commercial enterprises. Besides creating administrative difficulties, the adoption of differential rates across activities gave an incentive to arbitrage by shifting towards activities with a lower tax rate. Effective January 1st, 1989, the tax rates were once again set at 45 percent for commercial activities and at 35 percent for agriculture, industry, mining, hotels, and transport. Moreover, the fixed portion of the minimum tax levy was no longer differentiated according to the legal form of the company and was set at FMG 400,000 in all cases. On the other hand, the variable portion of the minimum levy was raised from 0.1 to 0.5 percent of sales revenue.

This description of the frequent changes in the structure of the IBS shows the difficulties the Malagasy authorities have had with settling on a satisfactory tax on company profits. Also, the numerous exemptions and differences in tax rates must have provided strong incentives for arbitraging across tax categories if not for outright evasion since the tax rates are quite high.

Taxes on individuals (IGR). The personal income of individuals was subject to two progressive taxes: a tax on wages and salaries (Impôt sur les Revenus Salariaux et Assimilés, IRSA) and a tax on non-wage income (Impôt sur les Revenus Non Salariaux, IRNS). The IRSA is independent of any revenue from sources other than wages and salaries, all of which are subject to the IRNS. There was no general complementary tax on revenues from all sources until recently.

Effective January 1, 1989, a major reform on the personal income tax system was introduced. For the IRSA, it involved a marginal tax structure with 9 "tranches" and a maximum marginal rate of 40 percent beginning at FMG 500,000 per month. For the IRNS, the reform involved a marginal tax

structure with 8 "tranches" and a maximum marginal rate of 50 percent beginning at FMG 5 million per annum.

In 1990, a new reform introduced a general tax on revenue (Impôt Général sur le Revenu, IGR), which was still strongly progressive and with a maximum marginal rate of 45 percent. The IGR, although not purposely set by the authorities to decrease the average tax rate, would eliminate the regressive elements that the previous system incorporated. The total revenue, independently of its origin, would constitute the criterion on the ability to pay taxes, so that some of the differentiations and injustices hidden in the old system would be eliminated.

Taxes on property. Taxes on property include (i) taxes on real estate which include a land tax levied annually on the estimated productive value of land based on the type of crop used, a tax on buildings levied on the rental value of buildings, and a surtax on buildings; (ii) death and gift duties which are levied on the net value of property causa mortis or inter vivos; and (iii) property transfer duties which are levied on sale, lease or exchange of property.

Other taxes on income. Other taxes on income include taxes on capital income for which the tax rates vary from 45 percent on dividends to 25 percent on other profits distributed by companies, and a tax of 15 percent on transfers abroad.

Collection of the direct taxes described above is low. Administrative capacity of central and local tax authorities is weak. Furthermore, the absence of an accounting system for taxpayers worsens the situation, since they do not have verifiable accounts. Indeed, eighty percent of the approximately 10,000 businesses subject to IRSA are taxed on a presumptive basis. Underestimation of income is therefore a widespread phenomenon.

2.2 Domestic indirect taxes

The Malagasy domestic indirect tax system is based on two major types of taxes: a value-added tax (Taxe Unique sur les Transactions, TUT) and a consumption tax (Taxe à la Consommation, TC).

Value-added tax (TUT). The TUT is a tax on value added which has a fixed rate. This rate was changed in 1983 from 10 percent to 15 percent. The TUT is applied to all sectors involved in local production including the services sector, and to imports. It excludes the necessity consumption goods, agricultural products and exports. The TUT is a major source of fiscal revenues. It represented on average 10 percent of the fiscal revenues between 1981 and 1988. Moreover, the TUT is not distortionary between sources, although exemptions between activities can be viewed as distortionary.

Consumption tax (TC). The second major tax on goods and services is the consumption tax. The TC covers more than 300 products including many inputs. A large number of goods which are excluded from the TUT are subject to the TC. The TC comprises multiple rates which depend on the type of product. It ranges from 5 percent to 500 percent, although most products are taxed at 5 percent or 10 percent. [Other indirect taxes include taxes on insurance premium and motor vehicle but represent a negligible share of the fiscal revenue (0.9 percent in 1988)].

2.3 Taxes on foreign trade

Import taxes in Madagascar serve two purposes: to protect the local industry against imports, and to raise fiscal revenue. Prior to 1988, restraints applied on imports included quantitative restrictions (QRs), customs duties, import taxes, consumption surcharges, and special import surcharges. After the fiscal reform of 1990, import duties were reduced to a customs duty, a fiscal duty on import, a value-added tax on imports (see above), and import duties on petroleum products.

Quantitative restrictions (QRs) were imposed in Madagascar mainly to overcome the shortage of foreign exchange. Moreover, imports of goods for which local production could satisfy demand were prohibited. QRs were completely eliminated in 1988 and 1989.

Customs duty (DD). The customs duty (Droit de Douane à l'entrée, DD) has seven different rates (0, 5, 10, 15, 20, 35, 45 percent) applied to the c.i.f. value of imports.

Import tax (TI). The import tax (taxe à l'importation, TI) is levied mostly on the c.i.f. value of imports or on physical volumes for selected goods. On January 1, 1988, the tariff reform introduced a simplified tariff structure which reduced the minimum number of brackets from 69 to 16, with a maximum rate of 80 percent and a minimum rate of 5 percent. (For certain products, a temporary surcharge of 30 percent was introduced to ease the transition period.) Effective January 1, 1989, the minimum duty was raised to 10 percent, except for some products such as fertilizers, pesticides, and pharmaceutical products. In addition, the temporary surcharge was cut to 10 percent. The ultimate objective of the tariff reform is to put into place a simplified tariff structure with rates ranging from 10 percent to 50 percent.

Other taxes on imports. The TUT and eventually the TC also affect imports as well as domestic production. The TC is applied to the c.i.f. value of imports, while the rate of the TUT is fixed at 15 percent and is applied to the c.i.f. value of imports inclusive of the DD, the TI, and the TC. A stamp duty (droit de timbre douanier) of 1 percent is levied on the perceived taxes (DD, TI, and the TC).

Export taxes. In order to encourage exports and reduce reliance on export duties and taxes. the government eliminated export taxes on all goods in 1987, except for vanilla, coffee, and cloves. In 1988, the export duty on cloves was set at the specific rate of FMG 110/kg, and the one on coffee was set at the specific rate of FMG 19/kg. Furthermore, an export surcharge is levied on coffee, cloves, and

vanilla in addition to the export duty. It consists of a rate of 10 percent for coffee, US$11 per kg. for vanilla, and 15 percent for cloves.

2.4 A Comparison with Other Countries

It is apparent from the above description that Madagascar has a very complex tax structure. This is not uncommon among developing countries which have been heavily influenced by their colonial legacy. The emphasis on progressive income taxes, a cascaded structure of indirect taxes, a schedular system for direct taxes, and a proliferation of exceptions encourage too many arbitrages that erode the tax base. Also, the resulting system would appear to be far too complex for the country's administrative capabilities as the recent simplifications in the tax system suggest. In his recent review of tax reforms in several developing countries, Thirsk (1990) has noted a general across-the-board move towards a streamlining of tax rates, abolishment of exemptions so as to bring transparency to the tax system and remove the opportunities for arbitrating across tax rates and tax categories.

Before turning to a quantitative analysis of the likely effects of such a tax reform, we compare briefly Madagascar's structure of tax revenues with that of other low-income countries. Comparisons are reported in table 2. The comparisons in table 2a suggest two observations. First, even among low-income countries, Madagascar's tax revenues (as a share of GDP) are a third lower than in other developing countries. From the description of the tax structure in section 2, this certainly cannot be due to low tax rates. Rather it must be a combination of tax exemptions and tax evasion. Second is the unusually high share of trade taxes in total revenues. The relatively high share of trade taxes in total tax revenue reflects a combination factors. First, is a weak administrative capability that must have reflected itself more strongly in the application of tax rates and exemptions for domestic taxes. Second, is the important share of coffee, vanilla and cloves (two-thirds of agricultural exports). For vanilla and cloves, Madagascar is likely to have monopoly power in world markets. Hence there is an argument for taxation

Table 2. Tax Revenues

(2a) A Comparison with Other Low Income Countries
(1986-88 average)

	Tax Revenue (TR)/GDP	Income Tax/ TR	Domestic Tax/TR	International Tax/TR
Low income countries[a]	16.3	22.4	27.3	30.9
Madagascar	11.8	14.3	28.3[b]	55.6

(2b) Madagascar: Budgetary Revenue (1988)[c]

Foreign Trade	Budgetary Tax on Goods	Income & Profits	Other
200.5	96.8[d]	51.4[e]	11.8

a. Low-income countries: sample of 36 countries with 1980 income per capita below $500. Average values for 1986-88. Source: Faini and de Melo (1991) table 2.

b. Includes taxes on goods and services and taxes on property.

c. Billion FMG. Source: Guillaumont et al. (1990) and authors' calculations.

d. Includes monopoly profits tax (24.8 billion).

e. Includes profits (22.7 billion) and wage tax (14.4 billion).

for taxation on both revenue and welfare grounds. Apart from export tax revenues, Madagascar's source of budgetary revenues is fairly similar to that of other low income countries.

The detailed figures of budgetary revenues for Madagascar in table 2b for 1988 reveal another characteristic of tax structures in low income countries: a distortionary tax structure across markets and activities. Trade taxes discriminate across markets, and profits and wage taxes discriminate against investment and employment.

We retain two conclusions from this brief look at the Malagasy fiscal system: a complex tax structure that yields relatively low revenues, and hence a suggestion of tax evasion; and a distorted tax structure that discriminates against trade and agricultural activities. In the following, we attempt to quantify both the potential loss in revenue from evasion and the distortionary costs of taxation while recognizing that the Malagasy administrative tax ability is weak.

3. A General Equilibrium Tax Model

We now describe briefly the general equilibrium tax model we shall use to evaluate the welfare and resource allocation effects of tax reform. The features of the model are standard to computable general equilibrium (CGE) models, except for the inclusion of the various taxes which reflect the Malagasy tax system. We therefore describe briefly the model using a one-sector formulation to save on notation.[1] The empirical application is with a ten-sector model calibrated to 1988 data whose aggregation is described in table 4.

Consumer behavior is represented by a linear expenditure system. The resulting demand functions (equation 1) are derived from the maximization of the Stone-Geary utility indicator. These

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[1] Except for the treatment of technology for intermediate demand and the treatment of taxes, the model's structure is quite similar to the one presented in de Melo and Tarr (1992, Chapter 3). For an introductory presentation to CGE models, see Dervis, de Melo and Robinson (1982, Chapters 5 and 6).

Table 3A. A One-Sector Tax Model

Consumer Behavior:

$$C = LES(P_Q, Y) \tag{1}$$

Production Technology:

$$X = CES(L_D, K_D, V; \Phi) \tag{2}$$

$$V = aX \tag{3}$$

Factor Demands:

$$\frac{L_D}{K_D} = CES(r, w; \phi) \tag{4}$$

Domestic Demand and Allocation of Traded Goods:

$$Q = CES(D_D, M; \sigma) \tag{5}$$

$$\frac{D_D}{M} = CES(P_D, P_M; \sigma) \tag{6}$$

$$X = CET(D_S, E; \tau) \tag{7}$$

$$\frac{D_S}{E} = CET(P_D, P_E; \tau) \tag{8}$$

Foreign Commodity Supply and Demand Functions:

$$\Pi_M = \bar{\Pi}_M \tag{9}$$

$$\Pi_e = \bar{\Pi}_e \qquad or \quad E = D_E(P_E; \tau_P) \tag{10}$$

Domestic Prices:

$$P_{VA} = P_X(1 - t_x) - a P_Q \tag{11}$$

$$P_x X = P_D D_s + P_E E \tag{12}$$

$$P_Q Q = (1 + t_Q + t_{VA}. P_{VA}) [P_D D_S + P_M M] \tag{13}$$

Table 3A. A One-Sector Tax Model (continued)

Foreign Commodity Prices:

$$P_M = (1 + t_M)\,\bar{\Pi}_M\, e \tag{14}$$

$$P_E = (1 - t_E)\,\bar{\Pi}_E \tag{15}$$

Market Equilibria:

$$D_D = V_D + C_D \tag{16}$$

$$D_D = D_S \tag{17}$$

$$L_D = \bar{L}_S \tag{18}$$

$$K_D = \bar{K}_S \tag{19}$$

Foreign Trade Constraint

$$e\,\bar{B} = \bar{\Pi}_M M - \bar{\Pi}_E E \tag{20}$$

Income and Government Revenue:

$$Y = (1 - t_L)\,WL_D + (1 - t_K)\,r\,K_D + Y_G + e\,\bar{B} \tag{21}$$

$$Y_G = t_X P_X X + t_Q P_Q Q + t_{VA} P_{VA} P_Q Q + t_M \bar{\Pi}_M M e + t_E \bar{\Pi}_E E e + t_L W \bar{L}_S + t_K r \bar{K}_S \tag{22}$$

Numéraire:

$$P_D \equiv 1 \tag{23}$$

Notes: A bar over a variable indicates an exogenous variable.

Table 3 (continued): Variables and parameters in the one sector tax model

- D_D domestic demand for domestic goods
- P_D domestic disposable (after tax) purchaser prices of domestic goods
- Y domestic income
- C personal consumption (composite)
- X gross domestic output
- L_D demand for labor
- K_D demand for capital by sector
- $\bar{V}$ total intermediate use (composite)
- $\bar{L}_S$ aggregate labor supply (exogenous)
- $\bar{w}$ average wage rate
- $\bar{K}_S$ aggregate capital supply
- r rental rate on capital
- Q composite good for domestic demand
- M imports
- P_M domestic currency price of imports
- D_S domestic production for domestic use
- E exports
- P_E domestic currency price of exports
- P_X producer price of domestic output
- P_Q purchaser price of composite domestic demand
- P_{VA} price of value added
- Y_G government income
- $\bar{e}$ exchange rate
- $\bar{B}$ exogenous net foreign borrowing
- π_M exogenous world price of imports
- π_E exogenous world price of exports (except when indicated)
- t_{VA} value added tax rate (base is total value added)
- t_Q excise or sales tax (base is domestic sales)
- t_M import tariff rate (base is domestic import demand)
- t_E export tax rate (base is exports)
- t_X indirect or monopoly tax (base is monopoly revenue)
- t_L tax on labor income
- t_K tax on capital income

Structural and policy parameters

- ϕ elasticity of substitution between labor and capital in domestic production
- a intermediate use coefficient
- σ elasticity of substitution between domestic and imported goods
- τ elasticity of transformation between domestic and exported goods
- t_D indirect tax rate on domestic sector production
- t_M import tariff rate
- t_E export subsidy rate
- τ_f elasticity of foreign export demand

demand functions allow for non-unitary income elasticities of demand and non-zero cross-price elasticities of demand between domestically-produced and foreign-produced consumption goods. The production technology is constant returns to scale and involves intermediates and two primary factors, capital and labor, which are mobile between sectors and are both in fixed supply. The functional form describing the production technology is a constant elasticity of substitution (CES) function to represent capital-labor substitution and substitution between domestic and foreign intermediates (equation 2), and a Leontief function between intermediates (as a whole) and gross output (equation 3). Atomistic firms maximize profits independently and are price-takers in factor and product markets. The resulting factor demands are given in equation 4.

The treatment of foreign trade recognizes that in an economy like Madagascar, domestic and foreign-produced goods are poor substitutes. Likewise, goods sold abroad and goods sold in the domestic market are imperfect substitutes. This formulation is known as the national product differentiation assumption. This assumption gives rise to the composite good aggregation functions in equations 5 and 7. By assuming that demanders (suppliers) minimize (maximize) the cost (revenue) of purchasing (selling) a given quantity of composite good Q(X), gives rise to the first order conditions in equations 6 and 8. Imports are in perfectly elastic supply (equation 9), but foreign export demand may not be perfectly elastic (equation 9) to reflect the possibility that Madagascar may have monopoly power for its principal agricultural commodity exports (vanilla, cloves).[2]

The following five equations describe prices and the various wedges introduced by the Malagasy tax system. The equations describing domestic prices (equations 11, 12, 13) result from the application of Euler's theorem to the linear homogenous functions describing technology choice and goods allocation across domestic and foreign markets. Three wedges are introduced: the "monopoly profits" tax, t_x,

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[2] For a description of the implications of this external closure on the shape of the domestic offer curve, see de Melo and Robinson (1989).

which is applied to all sales;[3] the sales tax (TUT), t_Q, which is applied to all sales on the domestic market; and the value-added tax, t_{VA}, which is applied to imports and to domestic value-added. The commodity tax structure is completed by tariffs on imports (equation 14) and by taxes on exports (equation 5).

The next set of equations (16, 17, 18, 19) describes the conditions for equilibrium in the goods and factor markets. The model includes a foreign trade constraint (equation 20) so that the equilibrium real exchange rate is determined endogenously. To facilitate the welfare interpretation of tax reforms, all government revenue, Y_G (equation 22) is returned to the representative consumer in lump-sum fashion (equation 21). Because of the linear homogeneity of all demand and supply functions, only relative prices can be determined. Hence the need to select a numéraire (equation 23).[4]

4. An Evaluation of Tax Revenue Loss

In this section we use the model to estimate the potential government revenue loss through exemptions and various forms of tax evasion (smuggling, bribery, etc.). Table 4 describes the ten-sector sectoral aggregation and tax revenues by tax instrument. The disaggregation into ten sectors was deemed the minimum one to capture the incidence of the main tax instruments used in Madagascar. The structure of the economy in table 4 and the values of the endogenous variables correspond to a "base" solution of the model. This calibrated base simulation replicates the actual disaggregated flows in the Malagasy economy in 1988.[5] Three quarters of exports originate in agriculture which is also, by far, the largest

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[3] In the numerical application, this tax is only applied to sales of agricultural products.

[4] By Walras law one of the equations in the model is redundant. However, for expositional purposes all equations describing the model are included in table 3.

[5] How we updated the 1984 input-output table and reconciled it with national accounts, foreign trade figures and budgetary revenue figures is discussed in an appendix available upon request. It would have been desirable to disaggregate agriculture into export cash crops and other (mainly for domestic use) agriculture. However, the input-output table did not make this distinction so further disaggregation was not possible.

Table 4. Calibrated structure of the economy in the base year
(shares)

Shares Across Sector (percent)	Agriculture (1)	Energy (2)	Processed Food (3)	Light Industry (4)	Heavy Industry (5)	Oth. Manuf. (6)	Transport (7)	Commerce (8)	Services (9)	Non-Market (10)	Economy-Wide Value[a] (11)
Output	29	6	18	6	4	2	13	9	10	3	794.2
Value-added	37	1	4	2	1	1	19	14	15	7	324.9
Employment	24	1	3	6	5	2	9	18	23	9	2842
Capital Stock	45	1	4	1	0	1	17	16	16	0	2364
Exports	74	5	3	5	0	0	11	0	2	0	55.9
Imports	2	25	12	16	20	3	10	2	10	1	78.9
Government Revenue	24	6	3	24	31	5	3	2	2	0	331.0[b]
Import Tax	3	9	3	30	46	8	0	0	0	0	156.2
Export Tax	100	0	0	0	0	0	0	0	0	0	43.8
Value-added Tax	40	2	4	2	1	1	20	15	16	0	40.3
Excise Tax	0	0	0	60	40	0	0	0	0	0	28.6
Elasticities:											
Import Demand	0.9	0.6	0.7	1.2	0.6	0.9	0.6	0.6	0.6	0.4	
Export Supply	1.0	0.6	1.0	1.2	0.6	0.6	0.6		0.6		
Consumer Demand	-0.4	-0.3	-0.4	-0.5	-0.2	-0.2	-0.4	-0.3	-0.4	-0.2	
Income Elasticity	0.8	1.2	0.8	1.4	0.6	0.8	1.2	1	1.4	1.6	
Capital Labor Substitution Elasticity	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	

Notes: All entries except elasticities are sectoral percentages of the corresponding variable (e.g. agriculture's share in gross output is 29 percent).

a. All values in rows 1 to 6 are 10 billion FMG except employment (1,000 man years). All tax collection data are in billion FMG.
b. The difference between sectoral tax revenue (269.4 billion FMG) and total government revenue is accounted for by the wage tax (14.4 billion FMG), the profits tax (22.7 billion FMG). the income tax (12.3 billion FMG) and the agricultural monopoly indirect tax (24.8 billion FMG), all of which are included in the model.

sector in the economy. About half of government revenue from tax collections originates in industry and a quarter from agriculture because of the export tax on vanilla, cloves, and coffee. Crucial to the general equilibrium estimates discussed here, are the assumed elasticity values for demand and supply. These are reported in the bottom of table 4 and can be viewed as representative of elasticities used in partial and in general equilibrium simulations.[6]

The sources of tariff revenue by sector and by instrument are further disaggregated in table 5. The purpose of that table is to provide the basis for our tax evasion calculations. To this end, we report side by side formal and effective (in parenthesis) tax rates. The effective tax rates are those that were derived from the national income and fiscal data and yielded the observed tax revenues. These are the tax rates used in the base calibrated simulation. Except for export taxes which are calculated from the tax revenues on exports of cloves, coffee, and vanilla, all other schedular tax rates in table 4 are drawn from the description of the Malagasy tax system in section 2. Import taxes are calculated from the published customs and fiscal duties, using imports as weights in aggregating to the sectoral classification in the model. To account for exemptions, we have applied the value-added tax to all sectors except non-market activities and the livestock component of agriculture. Because of the high variance across commodities (10 percent to 140 percent), we have assumed that the excise tax on consumption only applies to consumer goods. Our estimate of 30 percent is a guess of the average rate that is intended by the fiscal system. The actual revenues collected by the government in 1988 amounted to 360 billion FMG (see table 2b). Of this amount, 331 billion FMG are captured by the tax instruments incorporated in the model.

As can be seen from table 4, over 80 percent of tax revenues comes from taxes collected on a

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[6] In order to test the robustness of our calculations, we also report in section 5 estimates with high and low elasticities. High (low) elasticity sets are obtained by doubling (halving) the elasticity values reported in table 4. Because the revenue and welfare calculations are only mentioned briefly.

sectoral basis. Because sectoral tax collection is subject to efficiency losses through exemptions and disparity in rates, we shall concentrate our simulations on these sectoral taxes. Revenues collected from the four sectoral tax instruments incorporated in the model are also indicated in the bottom of table 5. They are the same as the totals reported in table 4, column 11.

Our first question then is how much would the government have collected had the schedular rates reported in table 5 actually been imposed. To answer this question, we solve the model with the schedular rates given in table 5 in lieu of the corresponding effective ones, and compare the results with the base solution obtained with the effective tax rates. Note that due to lack of information, there are no built-in differences between effective and schedular rates for export taxes. Hence, in the calculations reported below, revenue gains result from import duty, VAT, and consumption tax collection.

The estimated revenue less due to the combination of tax evasion, weak administrative collection, and exemptions (not incorporated in the formal tax structure described in table 5) is shown in table 6. Revenue loss is very large, ranging from 48 percent for import duties to 763 percent for the VAT. As expected, loss is much greater for the VAT and consumption taxes, as it is ten to twenty times larger in percentage terms than for import taxes. This very large difference is certainly partly due to a greater number of exemptions than those accounted for directly, for taxes on domestic sales provided to public and other enterprises. But the overriding factor accounting for this difference is still likely to be the relatively greater difficulty in collecting taxes on domestic sales in a country with a large rural population and a weak administrative system.

Table 5. Formal (Schedular) and Effective Tax Structure in the Malagasy Model (1988)
(Effective tax rates in parenthesis)

	Value added[b]	Taxes imports	Taxes exports	VAT (TUT)	Excise tax (TC)
Agriculture (39)[a]	1230	53.3 (40.3)	15.0	10.2 (1.6)	-
Energy (2)	60	30.3 (7.3)	-	15.0 (0.8)	-
Processed food (7)	220	62.0 (5.7)	-	15.0 (1.3)	30.0 (3.7)
Light industry (3)	104	55.3 (37.6)	-	15.0 (0.9)	30.0 (3.3)
Heavy industry	274	55.3 (44.8)	-	15.0 (0.4)	-
Other manuf. (1)	34	46.0 (44.8)	-	15.0 (0.9)	-
Transport (5)	143	-	-	15.0 (1.3)	-
Commerce (11)	357	-	-	15.0 (1.2)	-
Services (23)	730	-	-	15.0 (1.2)	-
Non-market (6)	194	-	-	-	-
Actual tax collection[c]		156.7	43.8	40.3	28.6

All tax rates in percent are formal rates as defined in the notes to this table.

a. Figures in parentheses are sectoral shares in GDP.
b. 10 billion FMG
c. Tax revenues are from Guillaumont et. al. (1990) and IMF (1990). Total tax revenues in table 4 are 331 billion FMG.

Notes to table 5

Calculation of formal rates

VAT. Application of sectoral shares in value-added to the VAT receipts. In agriculture, VAT was applied to 68 percent of that sector's value-added to take into account exemption on livestock. For imports, application of receipts reported in IMF (1990, table 1) applying import shares to the import classification in that table. (Imported raw materials among sectors 4, 5, 6 according to those sectors intermediate input shares.)

Excise tax. Application of sectoral shares in domestic sales to sectors 3 and 4 (Negligible excise tax revenues on imports omitted).

Trade taxes. Imports disaggregation of customs and fiscal duties reported in IMF (1990, table 1) according to import shares for food products from 1984 I/O table. (Raw materials treated as above; equipment goods classified as heavy industry; non-food consumption products classified as light industry. Energy tax rate from IMF (1989, table 18).

Exports. Rate obtained by applying the export tax revenue on coffee, vanilla and cloves on total agricultural export revenue.

Table 6. Increase in Revenue from Applying Formal Tax Rates[a] (percentage increase in parenthesis)

Tax Instrument	Import Duties	VAT (TUT)	Excise Tax (TC)
Revenue (billion FMG)	81 (52 percent)	308 (763 percent)	139 (486 percent)

a. Revenues obtained by solving the model described in table 3 with the schedular tax rates shown in table 5.

The estimates in table 6 thus suggest a very large revenue loss from the combination of exemptions, tax evasion, and smuggling. Under the application of the schedular rates, the combined revenues from import duties, VAT, and consumption tax would increase (percentage of base GDP in parenthesis) from billion FMG 225 (6.4 percent) to 528 (15.1 percent). No doubt, such revenue increases would be unattainable and exemptions are a large contribution to the shortfall in revenues.

The model also gives an estimate of the welfare loss that would occur from the increased tax burden (under the assumption that there are no tax collection costs or welfare gains/losses from tax evasion activities). Applying these schedular rates would result in an estimated welfare loss of 14 billion FMG (0.4 percent of base GDP). This relatively small welfare loss is common to general equilibrium estimates. In these calculations, however, this low magnitude also reflects that the movement to schedular rates would significantly reduce the dispersion in sectoral rates. This is so for two reasons. First, the dispersion between trade taxes and other taxes would be diminished. Across sectors, the VAT would be a flat 15 percent for all activities except agriculture (10.2 percent) and non-market activities (0 percent), and the excise tax, a flat 30 percent for processed food and light industry. The current effective rates

are also fairly uniform, but there is a great difference in level with the effective structure of tariff duties which would be reduced by a move to the schedular rates. Second, the dispersion in tariffs on imports would be much less under the schedular system. Both this reduction in dispersion across instruments and within the import tariff structure contribute to a relatively low welfare cost from applying the schedular rates.

5. The Relative Efficiency of Alternative Tax Instruments

To evaluate the efficiency of the tax system, we carry out three simulations. First, we calculate the welfare gains from removing taxes, one by one. This experiment is of course unrealistic insofar as the Malagasy government cannot use more efficient tax instruments (such as an income tax) than presently. However, this calculation gives a rough estimate of the likely revenue and welfare loss. Note first that, because we use a general equilibrium model, the actual revenue loss of abolishing a tax instrument is not necessarily equal to the revenue collection from that instrument because of general equilibrium repercussions. Second, we calculate the uniform tax structures that would give the same revenue as under the current effective tax structure. This experiment therefore approximates the intent of many recent tax reforms which have tended to flatten tax rates to reduce tax avoidance and tax evasion.[7] Third, we calculate Pigovian tax ratios which are a commonly used measure of the efficiency of a tax instrument.[8] For the second and third experiments, we assume that taxes are only applied to those sectors in which there was a positive effective tax rate (see table 5). Thus these calculations at least take partly into account the limits of the administrative tax capability of the Malagasy government.

Table 7 gives the estimated revenue loss and welfare effect of removing each tax, one-at-a-time.

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[7] For a description of the actual tax reform measures carried out in the ten developing countries, see Thirsk (1990).

[8] For similar calculations of Pigovian tax ratios see Clarete and Whalley (1987) and de Melo, Stanton and Tarr (1989).

Because the removal of these distortions is done on a piecemeal basis, one is inherently in a second-best situation, and there is no guarantee that welfare is increased. The largest source of revenue loss (and welfare gain) comes from removing trade taxes. Note the large revenue loss from removing export taxes in relation to the export tax base. The reason for this large loss in revenue is the dominating effect of the real exchange rate appreciation (about 6 percent). Two effects working in opposite direction are at play. On the one hand, by the balance of trade constraint, the increased export sales resulting from the removal of export taxes must be accompanied by an equal percentage increase in import volume (about 3 percent). Even though sectoral imports do not all increase by the same percentage amount, each one of them increases. Hence tax collection from import duties increases when expressed in foreign currency units. However, there is a countervailing (and dominating) effect coming from the real exchange appreciation so that the net loss in tax revenue, expressed in domestic currency units, exceeds initial government revenue by 5.2 million FMG.

The welfare gain from abolishing the excise (consumption) tax is very small because excise tax rates are low and relatively uniform (see table 5). In this model, there is no labor-leisure choice and no consumption-saving choice. Furthermore tax revenue is redistributed in a lump-sum to the representative consumer in the usual fashion. Hence uniform factor taxation that would not distort the wage rental ratio will not have any welfare effect. Neither will a uniform value-added tax which is equivalent to a uniform tax on capital and labor income (in the absence of income transfers from (to) abroad).

The results in table 7, however, suggest a small welfare loss from abolishing the VAT. This is counterintuitive since there is dispersion in the small effective value-added tax rates across sectors. The result is due to the fact that all the other tax instruments in the model remain at their base value rates when the VAT is abolished and, as noted above, the calculation is in a second-best situation.

Next we calculate the uniform tax structure which would yield the same revenue to the government. We proceed in two steps. Since there is very little dispersion in effective rates for the value-added and

excise taxes, we concentrate on trade taxes and on a uniform tax structure across all instruments. First we calculate the uniform tariff structure that would yield FMG 156.7 billion in total government revenue. Then we calculate the combined uniform tariff and export tax structure which would give the same combined revenue from trade taxes (FMG 200.5 billion). Second, we calculate the uniform sectoral tax structure which would also give the same government revenue as above. In all cases, as before, the uniform sectoral tax rates are only applied to the sectors with positive effective rates in table 4. In each experiment, all calculations are carried out maintaining the effective tax structure for the other tax instruments. However, the experiments are cumulative so that in the second set of calculations only the other tax instruments have their rates kept at their initial base values (see table 4 note b).[9]

Table 8. Revenue-equivalent tax structures

Uniform Tax Structure	Tax Rate[a]	Welfare change
Import tariff	25.0	6.3
Import tariff and export tax	19.0	3.9
All sectoral taxes given in table 5	6.0	16.8

Notes: Tax rates in percent. Welfare indicator as in table 7, expressed in billion FMG.

a. Uniform rate only applied to sectors with positive effective rates in table 5.

We start with uniform tariff rates. A uniform tariff rate for all imports (in sectors 1-6) would still be discriminatory since about one quarter of imports would not be taxed. However, there would be a

[9] To calculate the revenue-equivalent uniform tax structure, the model is solved by adding an additional equation constraining Y_G (in table 3 equation 22) to its base value with an additional endogenous variable, the endogenous uniform tax rate necessary to satisfy that constraint. Of course, the uniform rate is only applied to sectors with positive effective tax rates in table 5.

welfare gain of 6.3 billion FMG that amounts to 4 percent of the value of the tax base on imports. Moving to a uniform export tax and import tariff structure lowers the average tax on taxable tradable activities to 19 percent (recall that only the agricultural sector is taxed) but the welfare gain is smaller. At first sight this result is counterintuitive, but it must be recalled that this experiment starts from a second-best situation as taxation, though uniform, discriminates across sectors since not all sectors are taxed. Furthermore, other tax instruments are maintained at their initial rates. But the main reason for this lower welfare gain comes from the raising of the export tax on agricultural exports. Increasing this already high wedge is very distortionary and contributes to lowering welfare even though the average tariff is lowered at the same time.

We now come to the main result which is the uniformization of all sectoral tax instruments listed in table 5. Again this uniformization is only carried out across the sectors with positive effective tax rates in table 5 (for example, the excise tax is only applied to the processed food and light industry sectors). The welfare gain from not discriminating by sale destination is quite large, amounting to 16.8 billion FMG or 5 percent of total tax revenue collection.[10] Most interestingly, even though not all sectors are taxed, and uniformity is only achieved across the four taxes that discriminate across sectors, a uniform rate of 6 percent would be sufficient to yield the same revenue. Furthermore, the estimated benefits of such a move must be a lower bound estimate of the efficiency gains of such a piecemeal package as there would also be less resource waste in directly-unproductive-profit-seeking (DUPS) activities such as tax avoidance and smuggling.

Finally, we provide rough calculations on the relative efficiency of alternative tax instruments. As is well-known from standard taxation theory [see e.g. Atkinson and Stiglitz (1990)], the welfare cost of raising revenue varies inversely with the elasticity demand on the good to which the tax is applied. It

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[10] We also carried out this experiment with the high and low set of elasticities described in footnote 8. For reasons discussed in the text below and in figure 1, the corresponding values for the welfare gain under the high (low) elasticity set are: 32.0 (9.2) billion FMG.

is also well-known that taxes which do not discriminate by destination of sales are more efficient. To evaluate the efficiency of the alternative tax instruments, we calculate Pigovian welfare-revenue ratios for each one of the alternative tax instruments incorporated in the model. All welfare and revenue calculations are for 10 percent taxation starting from a distortion-free equilibrium.[11]

To add robustness to the calculations, the results are reported in table 9 for a set of high and low elasticities. An ad-valorem tariff duty at rate t shifts the world supply curve of imports from S_w to $S_w(1 + t)$. Figure 1 shows the effect of varying the elasticity of import demand on the welfare-revenue ratio. For the low elasticity demand curve, D_L, an ad-valorem tariff duty of t percent yields higher revenue at less welfare cost than a high elasticity demand curve, D_H. The same reasoning applies for excise taxes, and for export taxes in the case of an infinitely elastic foreign demand for Madagascar's agricultural exports.

The results in table 9 are straightforward when interpreted in the light of figure 1. The lower the elasticity set, the larger the revenue from the 10 percent tax and the lower the excess burden of taxation (reflected in a lower computed value of the welfare-to-revenue ratio in the last column of table 9). Also, an excise tax is more efficient than an import duty because it does not discriminate by source. We have not addressed the issue of export taxation. Madagascar being a major supplier of vanilla and cloves in the world market, could hope to raise welfare by taxing clove and vanilla exports. However, to get an idea of what the optimal tax should be for vanilla and cloves would require building a dynamic model incorporating the reaction of other suppliers of vanilla and cloves to changes in export taxes by Madagascar. This is beyond the scope of this paper, so we do not address the issue of taxation for vanilla and cloves.

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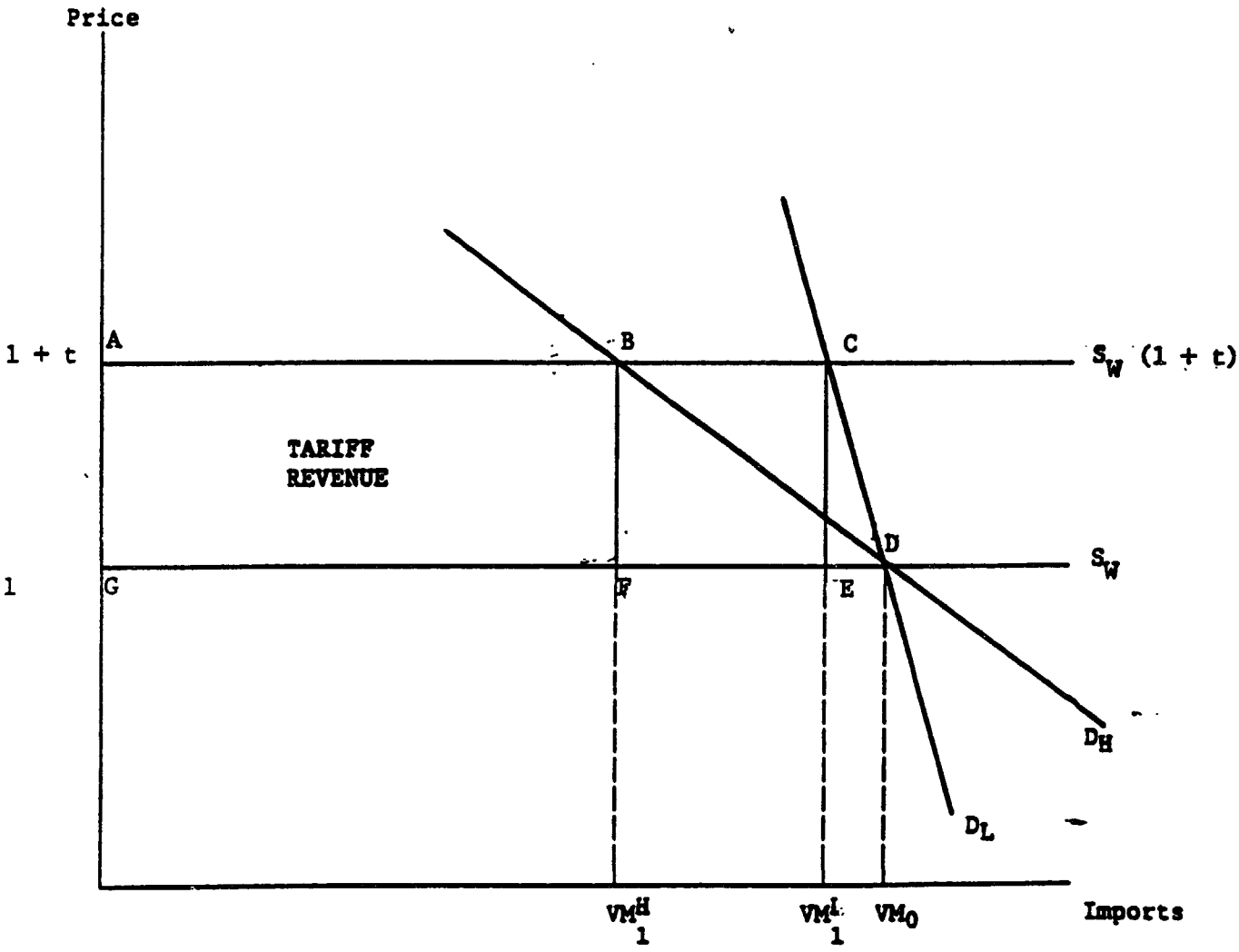
[11] The distortion-free equilibrium also includes no net transfers (B set equal to zero in table 3) so as to avoid valuation effects associated with changes in the value of the real exchange rate.

Figure 1. Elasticity of demand and efficiency of taxation



Note:

ACEG, CDE = revenue and welfare loss (low elasticity).

ABFG, BEF = revenue and welfare loss (high elasticity).

Table 9. Welfare cost per FMG of tax revenue (FMG billion)

	Elasticity[b]	Change in Government Revenue	Change in Welfare	*Welfare ÷ Revenue*
10 percent import[a] tariff	H	64.9	-1.78	-2.74
	L	75.9	-0.38	-0.005
10 percent excise[a] tax	H	61.7	-0.82	-1.3
	L	71.7	-0.50	-0.007

All comparisons are to tax-free equilibrium.
a. Rates only apply to sectors with positive effective rates in table 4.
b. Obtained by doubling (H), halving (L) elasticities reported in table 5.

6. Conclusions

This paper started with a review of the Malagasy tax system, comparing it to that of other low-income countries. We have shown that the tax system is relatively complicated with a large number of exemptions and dispersed tax rates. Compared with other low-income countries, Madagascar's tax revenues are skewed towards trade taxes (import duties and especially export duties). The review concluded that not only was the tax structure distorted and complex, but also that it yielded low revenues, suggesting tax evasion.

The second part of the paper developed a simple static general equilibrium model with a rich set of tax instruments to simulate the effects of piecemeal tax reform in the Malagasy environment. The model includes seven tax instruments and was applied to a 10-sector classification of the Malagasy economy for 1988. Several simulations were performed to assess both the likely magnitude of tax evasion and the benefits of piecemeal tax reform that would be revenue neutral in the sense of providing as much government revenue as was collected in 1988.

Several conclusions emerged from the simulations. First, the estimated revenue loss from tax exemptions and tax evasion was very large, reflecting in great part a weak administrative system and strong incentives to avoid taxes provided by high and non-uniform taxation across activities. Focussing solely on tax revenue (for a subset of sectors with positive effective tax rates) from import duties, export duties, VAT and excise tax, simulations showed that a uniform tax rate of 6 percent would have been sufficient to raise the same revenue as collected under the prevailing tax structure. Furthermore, lower bound estimates indicate a reduction in the excess burden of taxation by moving towards uniformity of about 5 percent of the tax base. Other results in the paper also suggest worthwhile efficiency gains from moving towards a more uniform tax structure with fewer exemptions.

References

Abdel-Rahman, A.M., F.-L. Corfmat, E. Sidgwick, and M. Steenlandt (1989), "Madagascar: Evaluation de la reforme tarifaire et mesures administratives de consolidation," Department of Public Finance, International Monetary Fund, Washington, November.

Atkinson, T. and J. Stiglitz (1980), Public Economics, McGraw-Hill.

Bery, E., M. Corgin and W. Stolper (1985), Intra African Trade and Economic Integration (mimeo), Elliot Berg Associates.

Bhagwati, J. and B. Hansen (1973), "A Theoretical Analysis of Smuggling," Quarterly Journal of Economics: 172-87.

Clarete, R. and J. Whalley (1987), "Comparing the Marginal Welfare Costs of Commodity and Trade Taxes," Journal of Public Economics, vol. 33, 357-362.

Dervis, K., J. de Melo and S. Robinson (1982) General Equilibrium Models for Development Policy Cambridge University Press.

Faini, R. and J. de Melo (1990), "Fiscal Issues in Adjustment: An Introduction," Ricerche Economiche, vol. 44, no. 2-3, 153-72.

Guillaumont, P. et al. (1990), "Politique Economique, Commerce Extréieur et Développement," UNDP-World Bank Trade Expansion Programme.

International Monetary Fund (1990), "Madagascar: Recent Economic Developments," Memorandum to the Executive Board, No. SM/89/231, International Monetary Fund, Washington, November.

Jensen, R., J. Thursby and M. Thursby (1988), "Smuggling and Camouflaging and Market Structure," Quarterly Journal of Economics.

Krueger, A., M. Schiff and A. Valdes (1988), "Agricultural Incentives in Developing Countries: Measuring the Effect of Sectoral and Economywide Policies," The World Bank Economic Review, vol. 2, no. 3, 255-72.

Macedo, J. (1987), "Currency Inconvertibility, Trade Taxes and Smuggling," Journal of Development Economics, 109-25.

Martin, L. and A. Panagariya (1984), "Smuggling, Trade, and Price Disparity: A Crime Theoretic Approach," Journal of International Economics, 201-17.

Melo, J. de and S. Robinson (1989), "Product Differentiation and the Treatment of Foreign Trade in Computable General Equilibrium Models of Small Economies," Journal of International Economics 27: 47-67.

Melo, J. de and D. Tarr (1992), A General Equilibrium Model of US Foreign Trade Policy, MIT Press, Cambridge, Mass.

Melo, J. de, J. Stanton and D. Tarr (1989), "Revenue Raising Taxes: A General Equilibrium Evaluation of Alternative Taxation in the U.S. Petroleum Industries," Journal of Policy Modelling, vol. 11, 425-49.

Pigou, A.C. (1947), A Study in Public Finance, Third edition, Macmillan.

Stolper, W. and A. Deardorff (1990), "Effects of Smuggling Under African Conditions: A Factual, Institutional and Analytic Discussion," Weltwirtschafliches Archiv, vol. 126, no. 1:116-40.

Thirsk, Wayne (1990), "The Experience of Tax Reforms in Developing Countries," Ricerche Economiche, vol. 44, no. 2-3, 321-48.

Yeats, A. (1991), "Can Preshipment Inspection Offset Noncompetitive Pricing of Developing Countries' Imports? The Evidence from Madagascar," PRE Working Paper No. 610, World Bank.

Appendix: The Madagascar Database

The general equilibrium model described in the previous section was calibrated to Madagascar starting from a social accounting matrix (SAM) estimated for 1988. The Madagascar SAM was based on a 32-sector input-output table estimated for 1984 by the central bank. This table was aggregated to the ten sectors described in table 4 and other data for 1988. The input-output accounts were then reconciled with national income and product account data for the same year, including the five categories of tax instruments specified in the CGE model. National income and tax and tariff data were obtained primarily from Guillaumont et al (1990).

Econometric estimates for the elasticity parameters do not exist for Madagascar, so values were obtained from extraneous sources. Sensitivity analysis in the text indicates that results are not much affected by relatively large variations in elasticity values. It would also be desirable to have more direct accounting information for 1988. We feel however, that the estimated SAM provides a consistent and serviceable data base for qualitative simulation analysis. For our purposes the major data drawback is that Madagascar does not have tax data disaggregated by sector. Hence our calculated imputed values described in the text may be subject to a relatively large margin of error.

A three-sector SAM is given in table A1. The three-sector specification given here is the simplest one which captures important characteristics of a trade-dependent economy like that of Madagascar. The primary sector is by far the most export-dependent, and represents less than 10 percent of imports. The manufacturing sector has the predominant share of imports and exports far less. The third sector is completely nontraded but accounts for about one third of domestic product and over 40 percent of value added.

As is apparent from the SAM, the direct incidence of sectoral taxation is highly nonuniform. Trade taxes make up about half of the government's total revenue and about two thirds of its sectoral tax

revenue. Moreover, these taxes represent the fiscal discrimination against the primary sector and in favor of the manufacturing sector, which was familiar in developing countries in the 1960's and in the 70's (see Krueger, Schiff and Valdes, 1988). Primary exports are taxed at an average rate of 11 percent and manufacturing imports face tariff protection of about 28 percent.

Table A1. Social Accounting Matrix for Madagascar, 1988
(billions of current FMG)

	Ag. Exports 1	*Mfg. Imports* 2	*Non-Tradable* 3	*Sala-ries* 4	*Exploi-tation* 5	*House-holds* 6	*TUT* 7	*Excise Tax* 8	*Monop Tax* 9	*Imp. Tariff* 10	*Exp. Tariff* 11	*Govern-ment* 12	*Accu-mul.* 13	*ROW* 14	*Inf. ROW* 15	*Total*
1 Ag. Exports	189	385	172	0	0	973	0	0	0	0	0	67	49	292	86	2213
2 Mfg. Imports	174	141	186	0	0	1018	0	0	0	0	0	26	254	142	0	1941
3 Non-Tradables	640	241	111	0	0	271	0	0	0	0	0	143	133	0	0	1539
4 Salaries	176	103	428	0	0	0	0	0	0	0	0	0	0	0	0	707
5 Exploitation	923	326	616	0	0	0	0	0	0	0	0	0	0	0	0	1865
6 Households	0	0	0	707	1865	0	0	0	0	0	0	5	0	70	0	2647
7 TUT	0	22	18	0	0	0	0	0	0	0	0	0	0	0	0	40
8 Excise Tax	11	10	8	0	0	0	0	0	0	0	0	0	0	0	0	29
9 Monopoly Tax	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
10 Imp. Tariff	0	156	0	0	0	0	0	0	0	0	0	0	0	0	0	156
11 Exp. Tariff	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
12 Government	0	0	0	0	0	141	40	29	24	156	43	0	0	0	0	433
13 Accumulation	0	0	0	0	0	244	0	0	0	0	0	192	0	0	0	436
14 ROW	33	557	0	0	0	0	0	0	0	0	0	0	0	0	0	590
15 Informal ROW	0	0	0	0	0	0	0	0	0	0	0	0	0	86	0	86
Total	2213	1941	1539	707	1865	2647	40	29	24	156	43	433	436	590	86	

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